Specification

Paragraph at page 5, line 29 - page 6, line 13:

The techniques of the present invention may be im-
plemented in the form of instructions stored in a memory
and executed by a general purpose microprocessor present
in a desktop computer, laptop computer, ~~viedo~~ video ar-
cade game, and the like. The techniques of the present
invention may also be implemented in hardware, i.e., us-
ing an ASIC that is part of a computer system. The syn-
thesized signals from the microprocessor or ASIC are out-
put to a user using an audio sound system that is either
internal to the system or part of an external sound sys-
tem connected to the computer system. The hardware pref-
erably includes conventional state-of-the-art components
well known in the art. Because the primary distinguishing
features of the present invention relate to the specific
synthesis techniques, the following description will fo-
cus on these techniques.

Paragraph at page 10, line 15 - page 11, line 9:

After the trigger process generates an event, the
algorithm passes ~~tot he~~ to the parameter selection. An
exemplary embodiment of the parameter selection component
of the invention is illustrated in the block diagram of
FIG. 4. Four different parameters are shown; however, any
number or types of parameters is within the scope of the
present invention. The parameter selectors shown are wave
selection, pitch distribution, pan (i.e., left-to-right
sound movement) distribution, and amplitude (i.e., loud-
ness) distribution. Each parameter selector is imple-
mented as a Gaussian distribution with independently se-
lectable mean and standard deviation, as well as fixed

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minimum and maximum values. In operation, the user se-
lects desired values of the mean, standard deviation,
minimum, and maximum for each parameter or for a subset
of the parameters. Each time an event is generated by the
trigger process, each parameter selector chooses a random
parameter value according to its distribution. If the
parameter value does not fall within the limits set by
the fixed minimum and maximum, then a new value is chosen
according to the same distribution until a value inside
the preset limits is found. Thus each module has an ef-
fective distribution equivalent to the original distribu-
tion with the intervals outside the limits set to zero
(and renormalized). ~~the~~ <u>The</u> chosen parameter values are
then applied to the wave chosen by the wave selection
process.

Paragraph at page 11, line 22 – page 12, line 24:

In an alternative embodiment, the inputs (mean,
standard deviation, minimum, maximum) to the parameter
selector distributions are varied in accordance with the
variation in the trigger process intensity parameter.
This is particularly useful in cases where the wave se-
lection or pitch distribution should shift as the inten-
sity changes. Returning to the car crash example, high-
intensity events at the beginning of the car crash should
be crunch sounds, while lower-intensity events at the end
of the car crash should be higher-pitched glass breaking
sounds. FIG. 5A illustrates one possible implementation.
A simple linear transformation or lookup table is applied
~~to he~~ <u>to the</u> intensity envelope to obtain inputs for the
parameter selectors. The intensity envelope can be used
to control some or all of the mean, standard deviation,
minimum, and maximum values input to the parameter selec-

tor. It can also be used to control some or all of the parameter selectors. The user can choose which inputs and which parameters depend upon the intensity envelope. The transformation applied to the intensity envelope can vary for the different inputs and parameters. Alternatively, as shown in FIG. 5B, envelope generators create separate time envelopes from the intensity envelope. These time envelopes are then applied to each parameter or each input to control the time dependence of the parameter. The parameter selector inputs can also depend upon events occurring within the game. As with the above example in which the trigger intensity changes after a goal is scored, the types of waves generated can change after an event occurs. This can be implemented by changing the minimum and maximum inputs to the wave selection process. Similarly, parameter values applied to the selected wave can also change in response to a particular game occurrence.

Paragraph at page 12, line 25 – page 13, line 13:

Finally, the playback engine generates sound according to the selected parameters. The playback engine is preferably a wavetable synthesizer such as a DLS (downloadable sound) unit generator containing samples appropriate to modeling a complex event. In the DLS unit generator, sounds from wavetables are downloaded ~~inot~~ into specific memory locations corresponding to specific program change numbers. Parameter implementation is preferably through standard controls within the playback engine. For example, in the DLS unit generator, pitch control is via a keyNum control, amplitude control is via a velocity control, and pan control is via a pan controller. Wave selection is via selection of program change,

provided that each sound sample has a unique program change number. In a standard DLS synthesizer, the keyNum-to-pitch mapping is hardwired at one semitone-per-keyNum, and thus there tends to be an unintended musical sound, especially if the waves are strongly pitched. If desired, finer pitch control can be implemented using the pitchBend command.